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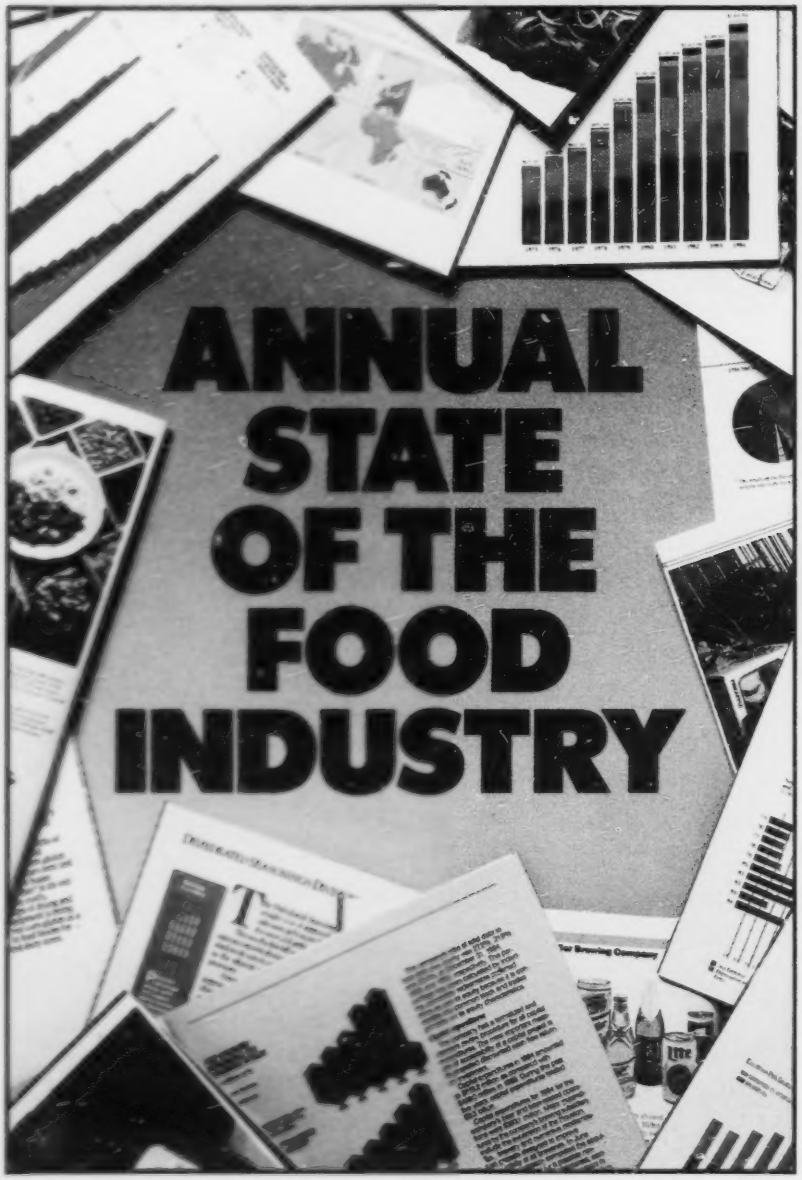
AUGUST 1985

Chilton's Food Engineering

In this issue: **FOOD PACKAGING**



WINNERS, LOSERS, SURVIVORS...

FE's Sixth Annual Report on the food industry. A market-by-market analysis spotlights trends.

INGREDIENT IDEAS

There were plenty of new ideas seen at the recent IFT show. See our editors' round-up of this show.

TROOP FOOD

The military remains the chief focus of retortable pouches, trays.

Chilton's Food Engineering

ABOUT THE COVER

Major acquisitions are still shaping the food industry in 1985. Expect more major consolidations as food giants merge for marketing, distribution advantages.

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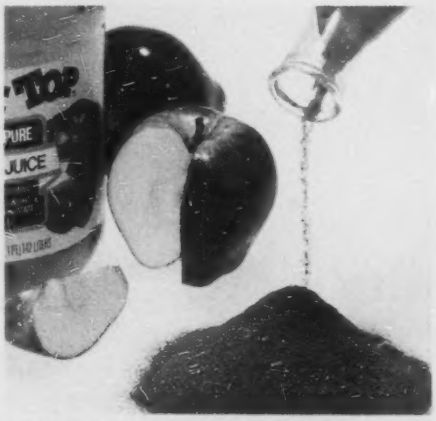

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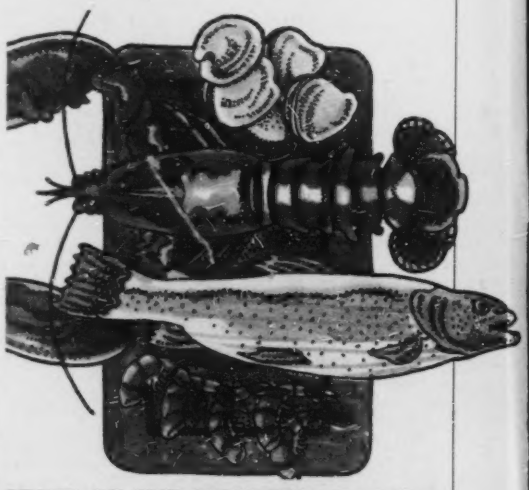

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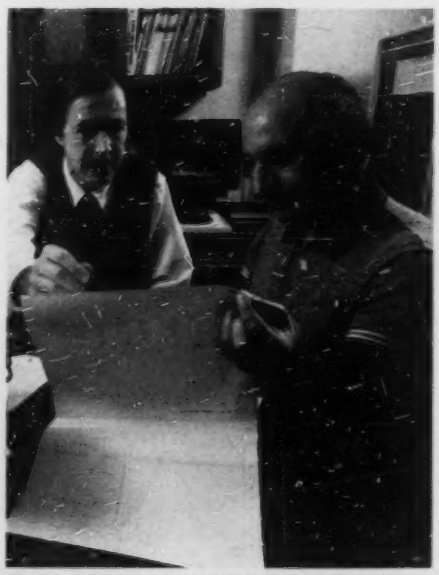

CHOLESTEROL INHIBITORS: Barley and oats have been found to contain cholesterol inhibitors that may be used to decrease the risk of heart disease. **PAGE 140**

Special Emphasis

PROCESSING EQUIPMENT:
Special focus is given to Processing equipment in this month's new product section.
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Selecting a new plant site? The central states may offer more

The Sun Belt is still ranked by the experts as Number One for its overall manufacturing climate, but the nation's mid-section is quickly closing the gap. The five-year outlook, they agree, points toward 'central America' as the biggest new plant growth area.

What's wrong with the sun?

The southeast, says Alexander Grant & Company, a management consultant firm, does indeed have much to offer today: A steady economic climate and low unionization.

But wages in the southern states are being driven higher by an influx of high-tech, high-paying jobs and labor short ages. "A no-holds-barred campaign by organized labor to embrace service and high-tech workers is having an impact on the South's nonunionized image, too," reports Alexander Grant. In comparison to all other states, wages in the southeastern states increased the most last year, according to the firm. (These southeastern states include Florida, Mississippi, Alabama, Georgia, S. Carolina, N. Carolina, Tennessee, Kentucky and Virginia.)

"Sunbelt cities are becoming victims of their own success," agrees John H. Boyd, president of The Boyd Company, location consultants.

"Water shortages cast doubt on future growth for some Sun Belt states, especially Florida, California and Texas," adds a spokesman from *Megatrends* author John Naisbitt's Washington, D.C.-based The Naisbitt Group. "In other areas, civil and social services are stretched to the breaking point, and government facilities are badly in need of repair if they ever are to accommodate growth."

DIANNE L. TAYLOR,
Associate Editor

What the Heartland offers

According to Boyd, the agricultural crisis has prompted heartland states to cast out new manufacturing lures—and increasing costs in the south are helping to reel in new prospects. "Most of the governors in the north central region are attempting to insure future economic stability by broadening the tax base without significantly raising tax levels for businesses and individuals," says Alexander Grant. (The north central region includes Montana, Idaho, Wyoming, N. Dakota, S. Dakota, Nebraska, Kansas, Iowa and Missouri.)

Construction activity, an indicator of

(Continued on next page.)

Comparative Annual Operating Cost Simulation

	Minneapolis Metro Area	Chicago Metro Area	Los Angeles/ Long Beach Metro Area	San Francisco Metro Area	Milwaukee Metro Area	Pittsburgh Metro Area	Philadelphia/ Camden Metro Area	Clay County, Missouri
Nonexempt Labor Weighted Average Hourly Earnings	$ 7.72	$ 7.66	$ 7.96	$ 9.19	$ 8.91	$ 7.99	$ 7.25	$ 7.24
Annual Base Payroll Costs ($1,000)	$ 4,336	$ 4,302	$ 4,471	$ 5,162	$ 5,005	$ 4,471	$ 4,072	$ 4,089
Fringe Benefits ($1,000)	$ 1,648	$ 1,635	$ 1,699	$ 1,962	$ 1,902	$ 1,699	$ 1,547	$ 1,554
Total Annual Labor Costs ($1,000)	$ 5,984	$ 5,937	$ 6,170	$ 7,124	$ 6,907	$ 6,170	$ 5,619	$ 5,643
Electric Power Costs ($1,000)	$ 297	$ 315	$ 362	$ 336	$ 253	$ 258	$ 342	$ 244
Natural Gas Costs ($1,000)	$ 311	$ 339	$ 543	$ 409	$ 391	$ 374	$ 382	$ 274
Occupancy Costs ($1,000) Amortization	$ 1,011	$ 1,011	$ 1,094	$ 1,122	$ 994	$ 994	$ 995	$ 979
Ad Valorem Taxes	$ 281	$ 233	$ 70	$ 78	$ 183	$ 161	$ 148	$ 75
Heating and Air Conditioning	$ 100	$ 123	$ 34	$ 80	$ 114	$ 84	$ 104	$ 82
Total Occupancy Costs ($1,000)	$ 1,392	$ 1,367	$ 1,198	$ 1,260	$ 1,291	$ 1,239	$ 1,247	$ 1,136
Total Power and Occupancy Costs ($1,000)	$ 1,919	$ 2,021	$ 2,103	$ 2,007	$ 1,947	$ 1,871	$ 1,971	$ 1,854
Transportation Costs ($1,000)	$ 389	$ 344	$ 659	$ 714	$ 363	$ 400	$ 454	$ 356
Total Annual Geographically- Variable Operating Costs ($1,000)	$ 8,293	$ 8,302	$ 8,932	$ 9,845	$ 9,211	$ 8,441	$ 8,044	$ 7,853

Source: The Boyd Co.

A Boyd location study compared measurable costs of a 295-worker snack food plant making annual shipments of 3.4-million pounds. Overall, the Clay County, Missouri, location proved the most profitable—saving anywhere from $630,000 to $2.192-million in operating costs. NOTE: You can receive this entire study free of charge by writing The Boyd Company Location Consultants, 29 Emmons Drive, Princeton, NJ 08540.

(Continued from page 29.)

capital investments and anticipated growth, is up in several key 'heartland' areas. Casper, Wyoming's 1984 construction activity was 24.7 percent above levels reached in 1983. Activity in St. Louis, Missouri was up 12.6 percent; Kansas City, Kansas, up 12.4 percent; Topeka, Kansas, up 7.1 percent; Sioux Falls, South Dakota, up 11.5 percent.

According to Boyd, food processors, in particular, are beginning to focus relocations on the mid-continent region of the U.S. for the following reasons:

- *New products/raw materials availability.* Wheat flour, rice, corn syrups and oats—these are a few of the supplies that can be found right in the back yard of a midwestern food plant.
- *Comparative economics.* Boyd's plant location studies repeatedly show that the central states are becoming economically viable. The company recently compared operating costs for a 295-worker snack food plant in eight metropolitan locations including: Kansas City, Minneapolis, Chicago, Los Angeles, San Francisco, Milwaukee, Pittsburgh and Philadelphia. Annual operating costs projected by Boyd ranged from $9,845,000 for a San Francisco location to the lowest figure, $7,653,000, for a Kansas City, Missouri site.

Costs for this study were scaled to a 150,000 square foot processing plant and included such geographically-variable factors as: Payroll, benefits, electric power, natural gas, amortization, property taxes, heating and air conditioning, and transportation. (See chart.)

Other Boyd studies show the central states in a favorable light. "It's definitely a trend," says Boyd. One report comparing annual operating costs (labor, utilities, occupancy, and transportation) of a 300-worker, Fortune 500 firm concluded the following: Houston, Texas, operating costs totaled $4.572 million; Atlanta, Georgia, $4.482; Phoenix, Arizona, $4.388; Philadelphia, Pennsylvania, $4.368; Kansas City, Missouri, $4.199.

- *Deregulation of transportation.* For those processors serving national markets, says Boyd, centrally located states offer transportation cost advantages. Shipping prices are becoming a function of geography and not so much a function of interstate commerce, says Boyd.

There's more to it than that

It's important to remember, agree these experts, that quantifiable factors—labor, energy, raw material access, transportation, taxes, population--can be compared from state to state to analyze trends. But other factors, such as quality of life and certain city restrictions, must be studied individually.

Take, for instance, the case of Frito-Lay's snack food plant in Frankfort, Indiana. Before deciding to build there, Frito-Lay management found one major problem with the site: The city couldn't handle the company's waste, which amounted to nearly one-half pound of byproduct per pound of finished product.

Frito-Lay ultimately built the plant in Frankfort and installed its own waste-treatment system—a system that now generates a direct revenue of $60,000 to $80,000 per year due to sale of byproducts processed by the system, including process oil, potato and corn solids.

Central Soya to sell food divisions

Central Soya has taken a turn away from its basic strategy of working to offset cyclical commodities profits through diversification. The firm will now emphasize its core commodity and energy and business by selling its branded food divisions.

As part of the new strategy, Central Soya president/CEO and former Beatrice president/CEO Donald P. Eckrich will become chairman and CEO upon retirement of Douglas P. Fleming this month, and Stanley P. Gold—president/CEO of Central Soya's parent Shamrock Holdings, Inc.—will also become president of Central Soya.

The branded food firms up for sale include Centre Brands, Fred's Frozen Foods, J. H. Filbert and Zatarain's. "These sales will be done in an orderly manner to achieve maximum value for these important business segments . . . ," said Eckrich. Executives of the branded foods companies will be involved in carrying out this decision, Eckrich added.

Central Soya—like ADM, which recently took over operation of A. E. Staley's former soybean mills (FE March, 85)—trends counter to companies such as Staley and Hormel, who have been reducing commodities operations in favor of "value-added" foods.

ACQUISITIONS SUMMARY

Borden adds strength to its pasta line

Borden, Inc.—distributor of Creamette, Luxury and Ronco pasta—has agreed to acquire Viviano Macaroni Co., a producer of Vimco dry boxed pasta. Viviano, headquartered in Carnegie, Pennsylvania, distributes pasta to foodservice markets in the mid-Atlantic region.

California Coolers to be purchased

Wine coolers—which according to Find/SVP brought in total wholesale revenues of $111.6-million last year—seems a promising market to Brown-Forman Corp., which has agreed to purchase California Cooler Inc. According to the *San Francisco Chronicle*, the deal will be worth about $146-million.

Sara Lee to sell potato subsidiary

With annual revenues of $75-million, Idaho Frozen Foods will be sold by Sara Lee to Universal Foods—if negotiations are successful. Idaho Frozen Foods, says Chairman and CEO of Universal John L. Murray, would provide the firm with its first entry into frozen foods distribution.

Staley Continental to buy foodservice firm

Staley Continental, Inc. has signed a letter of intent to acquire Smelkinson Brothers Corp., a full-line foodservice distributor located in Jessup, Maryland. Smelkinson's 1984 sales were approximately $100-million.

Bumble Bee buyout

Management of the Bumble Seafoods Division has formed a leveraged buyout of the division from Castle & Cooke, Inc. The new corporation, Bumble Bee Seafoods, Inc., was formed in June, 1985.

ACQUISITIONS STILL MOLD THE INDUSTRY

Major acquisitions are still shaping the food industry in 1985. Expect more major consolidations as food giants merge for marketing, distribution advantages.

For awhile it looked like the merger mania that dominated food industry news in 1984 would ease in 1985. Then, just a few months ago, we witnessed the biggest food merger of them all: R.J. Reynolds' acquisition of Nabisco Brands for $4.9 billion. What these multimillion dollar deals reveal is both an industry at the peak of financial health as well as one engaged in fierce competition for market share. This dichotomy has made conglomeration an important strategic weapon in achieving success in the food industry.

The high cost of developing and positioning new products is the fuel that drives many of these mergers. America's food companies are investing a lot of money in new products. H.J. Heinz is said to have spent $20 million to put its instant baby food product (shown below in the graphic) in the market. That kind of expenditure is becoming typical for launching a successful new product today.

Another reason mergers have become attractive is they offer the potential for more efficient product distribution. If, for example, a food company acquires a firm selling to the same supermarket or other retail outlets, they both gain an economy of scale. Potentially, they can make use of one sales force instead of two and a common physical distribution system.

Some industry observers, however, see danger in too much consolidation. Although neither for nor against consolidation, The Food Institute described four potential problems in continuing industry consolidation in a booklet entitled "Food and Business Mergers & Acquisitions of 1984". (1) Takeovers increase concentration and have adverse effects on competition. (2) Tax-motivated takeovers can generate economic losses for the economy. (3) Takeovers have the potential to crowd productive business projects out of capital markets. (4) Takeovers may also create incentives for management to concentrate on short-term performance to the detriment of long-term corporate investment.

Tax reform

If passed reasonably intact, President Reagan's tax reform program should have a favorable impact on many food processors. The chart on the following page, prepared by E.F. Hutton, illustrates how the proposed tax code would affect some of the nation's largest food companies. The food industry is, compared to some of America's other leading industries, heavily taxed with relatively few shelters. The average tax rate for larger food corporations is in the 40-45 percent range. Even with the loss of the investment tax credit, many food companies will see their earnings boosted by 10 percent or more. Among those reaping the largest benefit could be Hershey, Kellogg, Quaker Oats, Gerber and Ralston.

But don't expect to see monies gained through tax reform automatically fall to the bottom line. Because of the increasing competition in the marketing of food products, a large proportion of these gained funds will be channeled into marketing, advertising and other promotion efforts. Also, it should be

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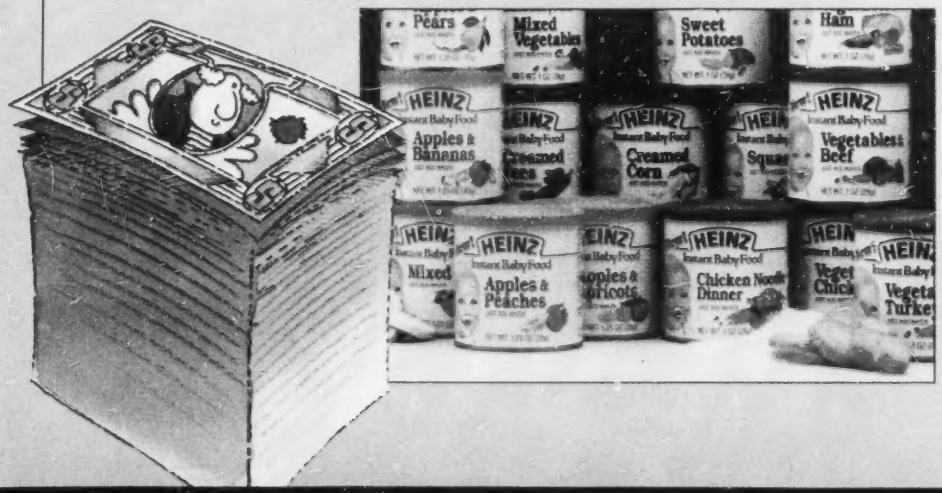

New product startup costs are high. Heinz' new instant baby food cost $20 million to launch. It may cost less to simply acquire an existing line of products or an entire company.

(Continued from previous page)
noted, the proposed tax code, if passed this year, does not take effect until 1986.

Market trends

Frozen foods set a hot pace. There's nothing cold or even lukewarm about the pace of frozen food sales over the last five years. From 1980 to 1983 the prepared frozen foods market has experienced vigorous growth. This year that category could well reach $5 billion in sales with more new products on the way. Still, there's only so much room in supermarket freezer cases. Is a major shakeout coming soon?

I'll drink to that. Maybe the most active new category of all is beverages. Soft drinks replaced water as the nation's number one beverage back in 1983, and the pace of new drink introductions remains brisk.

Within the beverage category, sales have been particularly strong for ready-to-serve fruit beverages. Aseptic packages have played a major role in invigorating this market. Fruit based beverages are said to be a $7.7 billion category in the U.S. and should grow another 3 percent in 1985.

Are we nearing a pasta war? Although we did not cover it as a separate category in this state-of-the-industry report, pasta is another food category developing lots of momentum. In fact, it's growing so fast it threatens international harmony. President Reagan recently ordered that tariffs on imported pasta be increased sharply in an effort to protect the $1.3 billion-a-year domestic pasta industry. American manufacturers currently produce 2 billion pounds a year but market penetration, particularly from Italian manufacturers, has been so swift the National Pasta Association predicts the Italians could gain 20 percent of the American market by 1988 or 1989.

Ethnic food boom. It seems ironic that American food companies would only recently begin to capitalize on the nation's ethnic diversity. Today, a wide range of Japanese, Chinese, Italian and other ethnic-based foods are highly popular in packaged foods. The hottest of these categories is the Hispanic market. In 1980, according to some figures, one out of every 15 Americans was Hispanic—a market of 15 million people and 4 million households. By the year 2000, one of out 10 Americans will be of Hispanic background. New products for this market are continuing strong into 1985.

Health and diet foods surge. These two categories are increasingly merging and appealing, in many cases, to the same customer base, according to some reports. The diet food market, including foods in which calories, fat, sugar and/or sodium contents have been reduced or eliminated, is approximately a $2 billion market. The $3 billion market for health foods, those foods free of "artificial additives," continues its expansion from a specialty market to mainstream America.

Coolers jazz up the wine market. The wine cooler, a lightly carbonated mixture of white wine and fruit juice with a 4 to 6 percent alcohol content, could be the most successful new product of the decade. A product area launched by entrepreneurs, they are being joined by majors such as Heublein, Seagram, G. Heileman, Pabst, and Gallo. Shipments of wine coolers have grown from 200,000 gallons in 1982 to approximately 27 million gallons in 1984.

ESTIMATED IMPACT OF TAX REFORM

	REPORTED (1)				TAX REFORM						
COMPANY	PRETAX INCOME	TAXES	TAX RATE	NET INCOME	NEW TAX RATE	ADJ. NET INCOME	% CHG	INCR. NET INCOME	PER SHARE	LATEST RPT/EST EARNINGS	ADJUSTED EARNINGS PER SHARE
Beatrice	$838.0	$349.0	41.6%	$479.6	36.5%	$531.8	+11.0%	$52.8	$0.58	$5.06	$5.64
Borden	325.1	142.7	43.9	182.4	36.6	206.1	+13.0	23.7	0.46	3.59	4.05
CPC International	329.2	138.2	42.0	191.0	38.9	201.0	+5.2	10.0	0.21	3.98	4.19
Campbell Soup	332.4	141.2	42.5	191.2	35.8	213.4	+11.6	22.2	0.69	5.93	6.62
ConAgra	153.8	61.8	40.2	92.0	35.0	100.0	+8.7	8.0	0.24	2.60	2.84
Dart & Kraft	848.1	392.3	46.3	455.8	38.8	518.8	+13.8	63.0	1.32	9.02	10.34
General Foods	621.4	279.2	44.9	342.2	36.5	394.0	+15.1	51.8	1.09	6.20	7.29
General Mills	398.7	165.3	41.5	233.4	35.6	256.8	+10.0	23.4	0.53	4.89	5.42
Gerber	100.4	44.0	43.8	56.4	35.0	65.3	+15.8	8.9	0.44	2.65	3.09
Heinz	402.2	164.7	40.9	237.5	37.3	252.3	+6.2	14.8	0.22	3.40	3.62
Hershey	209.4	100.7	48.1	108.7	35.0	136.1	+25.2	27.4	0.88	3.47	4.35
Int'l Multifoods	29.3	12.3	42.0	17.0	38.9	17.9	+5.2	0.9	0.11	2.10	2.21
Kellogg	476.1	225.7	47.4	250.4	37.6	297.1	+18.7	46.7	0.76	3.35	4.11
Nabisco	529.0	220.1	41.6	308.9	36.3	326.1	+5.6	17.2	0.30	5.02	5.32
Pillsbury	303.7	133.9	44.1	169.8	36.4	193.2	+13.8	23.4	0.54	4.05	4.59
Quaker Oats	260.1	121.4	46.7	136.7	37.5	162.4	+17.1	23.7	0.58	3.75	4.33
Ralston Purina	437.8	195.1	44.6	242.7	36.2	279.5	+15.2	36.8	0.40	3.60	4.06
Sara Lee	321.5	126.0	39.2	195.5	35.8	206.5	+5.6	11.0	0.20	3.25	3.45
Sysco	81.2	36.1	44.6	45.1	35.0	52.8	+17.1	7.7	0.36	2.14	2.50

(1) Latest year.
Source: E. F. Hutton & Company Inc.

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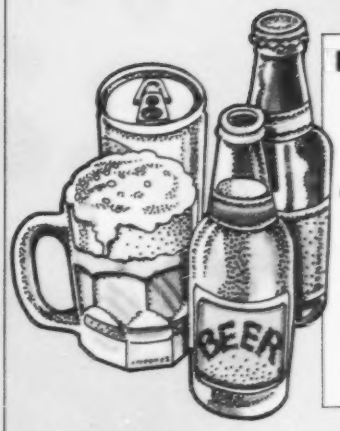
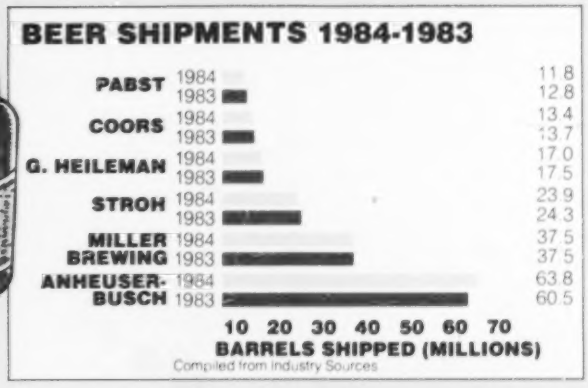




BEER

Jim Wagner, Senior Editor

Brewers were looking for a change in 1984. Unfortunately they got one. Beer volume, stagnant for two years, dipped two million barrels, the first decline in 28 years.

Of the "big six" only Anheuser-Busch gained ground. It shipped 63.8 million barrels last year, 5.5% more than 1983. A-B now accounts for 35.9% share of the market.

In comparison, second place Miller shipped nearly the same number of barrels—37.521 million in '84 vs. 37.466 million in '83. Miller's share is 21.3%.

The rest experienced heavy downturns. The worst was Pabst. Its volume fell 7.8%, from 12.8 million barrels shipped in '83 to 11.8 million in '84. Even G. Heileman Brewing, which hadn't lost volume in ten years, had a difficult year. Earnings declined 19.6% in spite of record sales of $1.341 billion. Earnings decreased from $56,969,000 in 1983 to $45,798,000 in 1984.

Only two brands were "winners' last year, and both belonged to Anheuser-Busch. *Budweiser* remained the best-selling beer with 24% of the market (44.1 million barrels), a 5% increase in brand growth. The other brand, *Bud Light*, now holds 2.3% of the market (4.2. million barrels), a 10.5% increase in brand growth (figures from *Beverage World*, March, 1985).

A few brands didn't do badly; they simply didn't achieve brand growth. The second most popular beer in America, *Miller Lite*, sold 0.4 million barrels more in 1984 than it did in 1983. And *Stroh's* and *Old Milwaukee* both were up 0.1 million barrels.

The remaining brands took a beating. *Miller High Life* ended 1984 down 3.2 million barrels. Pabst was down 1.6 million barrels. G. Heileman's *Old Style* dropped 0.3 million barrels. *Coors* fell 0.5 million barrels. And *Michelob* was Anheuser-Busch's only "loser" last year, selling 0.3 million barrels less in 1984 than it did in 1983.

There are several reasons why beer sales were off. Imports continued to grow at the expense of domestic beers. In its report, "The American Beer Market," Business Trend Analysts Inc., Commack, NY., points out that while imports represent only a fraction of the total market they are capturing big chunks of new market growth. From 1978 to 1983 U.S. beer consumption grew by 19.5 million barrels. Import volume hit 3 million. That represents more than 15% of the market growth during that time. According to the report, by 1995 imports will account for 25%.

The market itself is shrinking as well. Social forces such as a higher drinking age in many states and the view of alcohol as unhealthful have eroded sales. In addition, the number of people coming of drinking age is less. In 1982 there were 29.8 million people between 18-24 years old. In 1990 that figure will shrink to 25.1 million. By the year 2000 it will be down to 24.9 million.

All this means intense competition for breweries. Some were forced to tighten down capacity. Despite having the number two and three beers, Miller could not set a date for the opening of its modern Trenton, Ohio, plant built at an estimated cost of $280 million. Since it could not foresee when the brewery would be needed, it decided to write the asset down to its net realizable value in November. Another example is Stroh's, which announced it will close its 135 year-old Detroit brewery, cutting its capacity by 7.2 million barrels.

But most breweries are fighting back using marketing as the premier weapon. 1984 saw Miller complete the national roll-out of *Meister Brau* and *Milwaukee's Best*. Miller also introduced *Miller High Life* in a novel 32-ounce can called, appropriately enough, *King Kan*. Miller knows it must bolster Miller High Life this year and took steps to do so with an ad campaign in February.

G. Heileman tried to gain market share by acquiring Pabst. It almost succeeded last year, but just when it looked like its $11 per share tender offer would go through, Stroh Brewing and the Christian Schmidt Brewing Co. of Philadelphia blocked the acquisition with a preliminary injunction issued by a Federal District Court in Detroit.

Christian Schmidt is especially anxious to stop the purchase. Schmidt must expand to survive, and Pabst would give it access to the midwest. However, the Justice Department has approved the deal, and experts feel it's only a matter of time until Heileman acquires Pabst. Schmidt's fears it will face unbeatable competition in the midwest should that occur.

Breweries looking for a market niche with a future should look toward light beers. According to Business Trends Analysts, Inc., light beers should exceed 33% of all domestic beer consumption by the early 1990's compared to holding about 20% in 1984. That's in spite of the numerous brands already on the market—nearly every premium brand has a light counterpart. But analysts feel light beers will eat into premium sales, not the opposite.

A YEAR FOR THE RECORD BOOK

CATEGORY	PREVIOUS RECORD	NEW 1984 RECORD
EDIBLE PRODUCTS	8.4 BILLION POUNDS	8.5 BILLION POUNDS
FILLETS & STEAKS	670.4 MILLION POUNDS	721.7 MILLION POUNDS
SHRIMP	576.8 MILLION POUNDS	610.5 MILLION POUNDS
SHRIMP IMPORTS	341.4 MILLION POUNDS	342.5 MILLION POUNDS
PER CAPITA CONSUMPTION	13.1 POUNDS	13.6 POUNDS
SURIMI IMPORTS	33.1 MILLION POUNDS	70.6 MILLION POUNDS

Source: National Fisheries Institute, AFDF

SEAFOOD

Jim Wagner, Senior Editor

With few exceptions, 1984 was a record year for seafood. The most satisfying statistic: consumption hit an all-time high. Robert Arnold, director of marketing services for the National Fisheries Institute reported per capita seafood consumption reached 13.6 pounds in 1984, half a pound higher than the previous record.

Consumption records were also broken for fillets and steaks, shrimp, shrimp imports, and edible products—domestic production plus imports.

"Seafood marketing has improved, quality is top rate, and availability is better than ever," says Arnold. "It appears consumers are finally comfortable handling seafood. People always knew seafood was good for them, but they weren't sure how to buy it or cook it when they got it home."

Arnold also makes another interesting point. Usually, fresh seafood gains at the expense of frozen. In 1984, both fresh and frozen sales increased. According to the Food Marketing Institute, 42% of sales come from fresh and 58% from frozen.

A few trouble spots

While marketing may be all good news, the processing side had to contend with a few problems. Perhaps most important is the import situation.

Tuna processors were forced to take steps to battle imports which now account for over 20% of the market. Star-Kist (H.J. Heinz) closed its Terminal Island plant in Los Angeles, laying off 1,150 workers. President and CEO Richard Beattie was quoted in the Wall Street Journal as saying the reasons were $7.50 per hour labor costs compared to $1.00 per hour in other company facilities. The closure did not affect overall production. Another packer, Ralston Purina, closed its Van Camp Seafood tuna cannery in San Diego for the same reasons. With Ralston it may also be a case of reallocating capacity. The cannery had been running at 40% since 1982, according to a report in the Wall Street journal (4/12/84).

Tuna canners weren't the only ones with import problems. Shrimp processors had to comply with a FDA regulation last year concerning sulfite levels in imported shrimp. In October, FDA ruled that shrimp with over 40 ppm sulfite content will be allowed into the U.S. only if the sulfite appears on the ingredient label. Most if not all shrimp coming into the U.S are treated with sodium bisulfite to combat "black spot." As a result, importers have been scrambling to get the proper labeling for shrimp over FDA's limit. Supplies may tighten in 1985 as a consequence.

Consumption higher than ever

Imports are gravitating to the U.S. because of the rising demand for tuna and shrimp and the high value of the dollar. Per capita canned tuna consumption rose 0.1 pounds to 3.2 pounds annually, continuing a rise that began two years ago. Shrimp hit a record 1.90 pounds, compared to 1.71 pounds in 1983.

"Tuna has always been consistent, with the exception of a dip in 1982," says Arnold. "Shrimp is the 'star' of the seafood industry. Consumption has risen every year for ten years."

Another area that did very well last year and continues to prosper this year is adult-oriented, premium priced seafood like Van De Kamp's *Today's Catch* or Mrs. Paul's gourmet dinners. Van de Kamp estimates the category experienced 38% growth between 1983 and 1984 and now accounts for $100 million of the $870 million frozen seafood category.

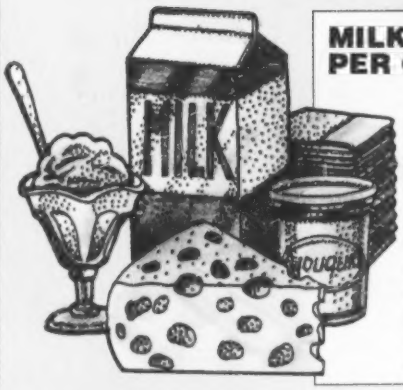
And another very bright spot was farm-raised seafood. Shrimp is the primary attraction because of high demand. A research report from Texas A&M University placed these values on shrimp farming.

"Revenues from shrimp farming are estimated to be $2,500 per acre with profit potentials between $100 and $400 per crop acre." Dr. Addison Lawrence, marine scientist with the Texas Agricultural Station, says 1,000 acres of water could produce shrimp worth $2 million.

Two shrimp farms began operating along the South Texas coast and three more were planned. In the near future, Texas could see a $90 million cultured shrimp business on its shores.

While shrimp is still a *potential* money-maker, catfish farmers saw solid profits last year. According to Delta Catfish Processors of Indianola, Miss., catfish consumption is growing at a compounded rate of 30% a year. Delta reportedly has 35% sales growth and expects to hit $55,000,000 over 1984-1985.

Lastly, surimi saw more activity last year than ever before. In 1980, about 3.26 million pounds of surimi were imported. In 1984, that figure exploded by a factor of 21.6 to 70.6 million pounds according to the Alaskan Fisheries Development Foundation (AFDF). By 1990, it could reach one billion pounds, according to Judy Hill of Seafood Management Inc.



MILK AND DAIRY PRODUCTS PER CAPITA CONSUMPTION

	1983	1984	% Change
Whole milk	127.4 lbs	122.7 lbs	−3.7
Lo-fat milk	77.8	80.8	+3.8
Skim milk	11.0	11.9	+8.2
Yogurt	3.2	3.6	+12.5
American cheese	8.9	9.7	+8.9
Ice cream	18.0	17.8	−1.1
Cottage cheese	4.2	4.1	−2.4
Other cheese	9.0	9.5	+5.6
Ice Milk	6.9	6.9	0.00

Source: Milk Industry Foundation

MILK & DAIRY

Jim Wagner, Senior Editor

Last year was characterized by peaks and valleys for the milk and dairy industry. Strong marketing efforts improved cheese and yogurt consumption, and butter-margarine blends were introduced to do the same with butter. But milk supply and demand remains unbalanced, even though the 1983 Dairy Bill worked exactly as planned. And ice cream consumption fell 1.1%, except for premium brands.

Cheese sold very well in 1984. Shipment value of cheese increased over 11%, from $4,929,000,000 in 1983 to $5,474,000,000 in 1984 (Predicasts, '72 dollars). Sales of American-type cheeses rose nearly 11% while other types rose 8%.

Yogurt also performed well. On the strength of its "healthy food" image, per capita consumption increased 12.6%, rising from 3.2 pounds in 1983 to 3.6 pounds. Frost & Sullivan estimated that the 1984 yogurt market, worth $662 million, will blossom into a $757 million category in four years. Kraft reported 40% sales growth for *Light 'n Lively* lowfat yogurt while Borden had double-digit gains due largely to the introduction of *Weight Watchers*.

Ice cream slumped last year. Per capita consumption shrank from 18.0 pounds in 1983 to 17.8 in 1984. Premium ice cream supported the category. Kraft, for example, reported both tonnage and profit declines in its Dairy Group due in part to the discontinuance of the fluid milk business and lower *Sealtest* ice cream volume. But *Breyers* ice cream was a buoying force, selling strongly in Midwest expansion markets.

Butter rebounded slightly. 1984 shipments were valued at $745 million compared to $736 million in 1983 according to Predicasts. But the category is predicted to slip in the future as consumers turn to low-calorie margarine and blends.

Milk still unsettled

For better or for worse, the 1983 Dairy Bill working as designed. On-farm production of fluid milk fell from 139,672,000,000 pounds in 1983 to 135,444,000,000 in 1984 according to the Survey of Current Business. Mid-America Dairymen, perhaps the strongest proponent of the Bill, reported these other results:

- Government expenditures for dairy price supports were cut in half. Dairy products bought by the Commodity Credit Corp. were down from 16.8 billion pounds milk equivalent in 1983 to 8.6 billion in 1984.
- The farmer-finance diversion program reduced milk production and cut government costs by $1.2 billion. The milk surplus, which ran 10-12% higher than demand, is now estimated to be around 3% over demand. As of January, 1984, farmers who cut production below base levels were awarded payments of $10 for each 100 lbs. The program was paid for by a 50¢ per cwt charge on all milk sold.
- A 15¢ per cwt deduction was made from every dairy farmer's milk check starting in May, 1984. About $195 million was raised for marketing and sales efforts.

The Dairy bill was passed as a way to bring milk supply and demand into balance. These figures show it made inroads. But the Bill is at the end of its 15-month period. Production is edging up again, and the situation may revert to an imbalance by the summer of 1986 according to an industry spokesman, unless consumption increases dramatically.

Which isn't likely. Last year fluid milk consumption gained only 1% overall, and future increases will be about the same. Demand for whole milk products fell while consumption was up for low fat and skim milk. Borden, for example, reported "substantial growth" for its Hi-Protein lowfat milk due to increased sales to calorie-conscious adults.

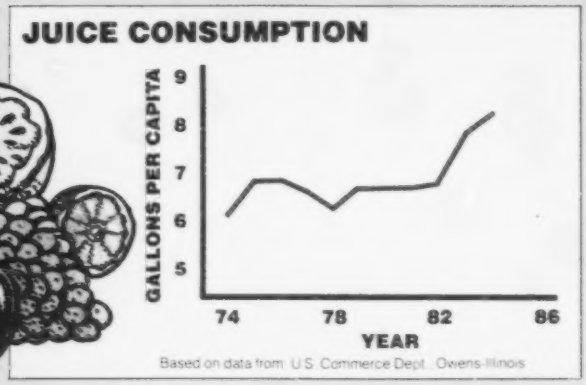
Butter blends coming

Butter sales have been eroding. In 1983, 1,299,200,000 pounds were produced. That fell to 1,120,100,000 in 1984, according to the Survey of Current Business.

To offset the trend, butter blends have been developed within the last three years. Land O' Lakes was the first with *Country Morning Blend*, which has 40% sweet cream. Stakes are high, as the market for butter blends is estimated to be $65 million.

So far, consumers have been reluctant to accept blends. The reason is price—why pay butter prices for a product that's only part butter? As prices drop, however, and marketing picks up, butter blends are expected to do better.

Kraft especially is looking for a blend to catch on. In 1984 it introduced three products into test markets. *Touch of Butter* appeared first followed in fall by *Sheffield Farms Dairy Blend* in the southeast. The latest was *Parkay Plus*, a margarine with 25% cream. It sells for $1.19, compared to butter at $1.79.



JUICES

Kevin Hannigan, Features Editor

The market for juices continued strong in 1984, with consumption reaching 8.2 gallons per capita—an increase of more than 5% over 1983. "The juice market has seen a rather significant turnaround," says Owens-Illinois Packaging's Michael L. Teadt, "due at least in part to consumer concerns for fitness and health." Teadt also notes the sharp increase in total juice consumption between 1980 and 1984—paralleling the rapid rise of aseptically packaged fruit-juice drinks.

More than a dozen of these aseptically packaged products were introduced in 1984, ranging from traditional orange, grape and apple juices to fruit nectars such as peach, apricot, guava, and pineapple-banana. The increased sales of these "boxed" juices have more than offset declines in canned product, according to *U.S. Industrial Outlook: 1985*. The retail market for single-serve fruit juice drinks in bottles and cans is estimated at about $280 million, for example, while the market for aseptics is put at more than $400 million.

Aseptics, juice blends

Aseptic packaging has turned the juice-drink market around, while consumer interest in natural, healthful foods has stimulated new entries in the other juice categories.

Procter & Gamble's new *Citrus Hill* orange juice, for instance, has lifted that entire category. And Seven-Up's newly formed Foods Group came up with *JuiceUp*, an exciting 5-item line of frozen lemonade and lemon-limeade concentrates that includes the first "diet" versions of juice concentrates.

At Tree Top Inc., the action is in pure fruit juice blends. In Western states, these blends have grown 312% in the past year. And, of this growth, Tree Top claims about 80%. Its new 100%-juice combinations, reports Dennis J. Colleran, president, offer the consumer pure fruit juice, not just a "drink."

Others are rushing to market with new blended products, too. Campbell Soup has introduced *Juice Works*—four blended, 100%-juice drinks aimed at mothers with guilt feelings "about giving their kids high-sugar bellywash." And Nestlé's Libby, McNeill & Libby Inc. is rolling out a similar product, *Juicy Juice*. Another new item from Coke is *FIVE ALIVE Tropical Citrus Beverage*—a combination of five fruit juices (orange, lemon, pineapple, tangerine and apple).

Packaging changes abound

A grower cooperative oriented to finding uses for surplus crops, Tree Top has literally created the products it sells. "In the early years, it was relatively easy to sell our products because our output was smaller and there wasn't a lot of competition," Colleran says, "but our growers are producing more apples now and competition has increased."

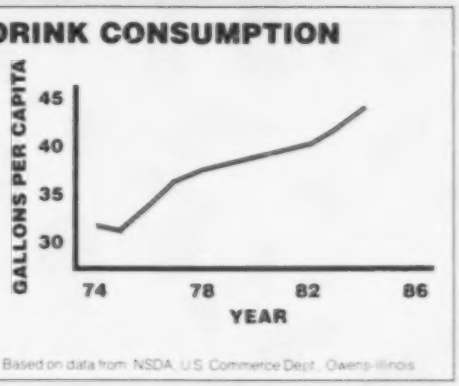
The solution to this problem, Colleran believes, is "to approach the marketplace vigorously and be aggressive in meeting customer needs." New packaging is part of that plan. Thus, the company unveiled *Apple Juice On Tap*, the first "bag-in-box" fruit juice, in June 1984. And the new blended juices are sold in composite cans. Both the blends and *Tree Top Apple Juice* also are available in 250-ml aseptic packages.

Likewise, Campbell Soup is now selling *"V-8" Juice* in refrigerated cartons in food stores for the first time. Previously, the product had been marketed only in cans. Marketing Manager Avis Yuni states that, with the refrigerated cartons, "we are now able to provide 'V-8' in a package which is preferred by a great number of consumers who would not normally buy it." Yuni explains that, from 1979 through 1984, refrigerated juice drinks recorded an 89% increase in sales, with the 64-ounce carton being the dominant size. She adds that tests showed refrigerated "V-8" outselling virtually all other chilled carton juices except branded orange juice.

Much of the sales growth for juices during the past 15 years has been in chilled juices sold in glass. "Now," says O-I's Teadt, "a number of alternative glass containers are available, including a 1.3-liter package which has been very well received." Single-serving 8- and 10-ounce juice bottles also are doing very well, due partly to changes in distribution. Juice packers have had great success, for instance, in getting convenience stores to accept the glass package.

The juice market for aluminum cans is on the verge of rapid expansion, too, according to Reynolds Metals Company. Along with its patented liquid-nitrogen system for non-carbonated beverages, Reynolds has developed an aggressive marketing plan for juice packers. Reportedly, New England Apple already has increased both its retail and vending-machine juice sales using Reynolds' aluminum cans.

All in all, the outlook for all kinds of juice drinks is very bright. The only dark cloud is a possible tightening of supply as the use of juice in soft drinks and other food products increases. Thus, the market for fruit-juice blends should continue strong.



SOFT DRINKS

Kevin Hannigan, Features Editor

Americans drank more soft drinks than ever in 1984, averaging about 43.6 gallons per capita according to Department of Commerce figures analyzed by Owens-Illinois' Packaging Operations. That's about 2.1 gallons more per capita than in 1983. All in all, it was a very good year.

Strong consumer demand for diet sodas and greater disposable income contributed to the 1984 record. For the year, the quantity of soft drinks shipped increased by an estimated 5-6%, and the value of shipments reached about $20 billion, up 8.4% over 1983. Adjusted for inflation, the value of shipments rose more than 5% in 1984. By comparison, industry shipments in constant dollars rose about 1.5% annually during 1980-83.

Profit margins tighter

Soft drink consumption has grown steadily for the past 20 years, says National Soft Drink Association. But all isn't joy on the marketing front. In spite of improving sales and rising volume, profit margins aren't keeping pace. In general, bottlers of high-volume cola brands are faring better than other bottlers.

Cola soft drinks are the dominant market type with 63.2% share; lemon-lime sodas are second with 12.7%; and orange is third with 7.0%. Other citrus flavors hold about 4% of the total market. Now, Pepsi and Coke seem to be going after these latter segments with new and/or improved products.

Seven-Up commands more than 50% of the lemon-lime segment, which grew 7.8% in 1984 compared to a 5.6% increase in cola shipments. Its new competition will come from *Slice*, a citrus-based carbonated soft drink introduced by Pepsi-Cola that contains 10% fruit juice. Coke is testing *Minute Maid Orange Soda* and *Diet Minute Maid Orange Soda*, both with 10% real orange juice. These new products join *Sprite* and *Diet Sprite* (in the lemon-lime segment), *Fresca* (grapefruit-flavor category) and *Mello Yello* (sugar-citrus flavor segment).

Diet drink sales of the major franchise brands (Coca-Cola, Pepsi-Cola, Seven-Up) rose an estimated 18-20% in 1984. But the popularity of aspartame-sweetened diet drinks also provided a major boost for most other bottlers. With demand rising, diet drinks were about 21.5% of the market in 1984, up from 20% in 1982. And, by mid-year, diet drinks from Procter & Gamble, Shasta, Canfield, and the Squirt Company used only aspartame.

Last November, Pepsi-Cola decided that all of its diet colas would use aspartame in the future. Currently, Pepsi is second in the diet-cola market, but this move to 100% aspartame should heighten competition with *Diet Coke*. Seven-Up also reformulated *Diet 7Up* and *Sugar-Free Like* to use 100% *NutraSweet*.

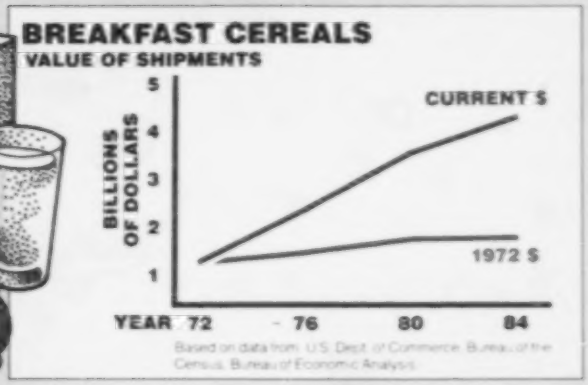
Move to larger packages

Major changes are occurring in soft drink packaging. During 1978-84, use of plastic containers for soft drinks rose from 7.6% of the total to 22.6%. The metal can's share of a larger market dwindled from 43.8% to 35.7%; while glass container usage dropped from 48.6% to 41.7%. Meanwhile, demand for carbonated beverages in single-serve bottles and cans (16 ounce and less) declined as consumers showed a preference for larger sizes. Between 1978-82, demand for 6- to 9-ounce bottles fell 78%, and dropped 42% for 10- to 12-ounce bottles. Shipments of 16-ounce bottles, though, rose 18%.

Many bottlers moved to add larger, 3-liter (101-ounce) plastic bottles to their product lines in 1984. But grocery retailers expressed concern about the space demands of still another soft drink packaging variation. Since shelf space is limited, retailers may be more selective in the future, and lower-volume brands may be reduced or eliminated.

The soft drink industry is using more all-aluminum beverage cans, too, according to recent figures from Reynolds Metals Company. Shipments were up 11.5% through April, and Reynolds expects total aluminum soft drink can shipments to exceed 35 billion units this year. Based on industry sales figures, the total number of aluminum cans in demand for 1985 may reach 70 billion or more. Combined with the industry's given capacity, this more than likely will create a situation in which demand outpaces supply in some regions. That was the case last Summer, and this supply constraint will probably be repeated again in the Summer of 1986.

According to *U.S. Industrial Outlook: 1985*, the carbonated soft drink industry should have another good year in 1985. Value of shipments in constant dollars should increase 5% over the 1984 level. But, for the long term, prospects are mixed. Adjusted for inflation, the value of soft drink industry shipments is forecast to increase 1.8% annually over the next five years. But it's likely that demographic shifts and changing taste patterns will restrain consumer growth.



CEREALS

Kevin Hannigan, Features Editor

In 1984, says *U.S. Industrial Outlook: 1985*, the estimated value of shipments by the cereal breakfast food industry increased to $4.5 billion in current dollars. Adjusted for inflation, however, the value dropped 1.1%. That fact characterizes the entire market for breakfast cereals, and helps to explain the dynamic marketing war now being waged there.

A changing marketplace

Changing purchasing patterns, moderate food prices, and strengthened disposable income prompted consumers to spend more last year. In the process, heavily advertised brands recovered ground lost during the last recession. But the market share of generic and private-label cereals, never more than 5% of sales, contracted to less than 2%.

In 1984, manufacturers' prices for cold and hot cereals gained only 3.7% and 2.1%, respectively. By comparison, producer prices of all foods increased 4.4%. Meanwhile, costs kept rising. Oats cost 12.6% more in 1984, for instance. And packaging costs rose faster than most ingredient costs. Furthermore, during 1977-82, changing consumer preferences caused firms to alter their ingredients mix. As a result, breakfast cereal companies increased their use of fruit by 15.5% annually.

Changes in taste affected the demand for some cereals. In 1972-77, for example, wheat-based products rose markedly—but corn-based items grew very slowly. Rice cereals fell somewhere between. In 1977-82, however, consumption of corn-based cereals edged up 2.1% a year, while wheat-based products dipped 0.6%. Then, in 1984, it turned around again. Consumption of corn-based items dropped about 3.2%, while wheat-based products advanced 9.7%.

Demographics play an important role, too. Children under age nine make up the fastest-growing segment of the $4-billion cereal market and should reach 20% of the population by 1990. But the number of children aged 5-14—the major consumers of presweetened cereals—shrunk by 0.6% annually between 1979 and 1984. At the same time, the 20-49 age group, important consumers of unsweetened cereals, rose 2.6% yearly.

The result is that convenience, nutrition and parental concerns shape much of today's cereal market. Vitamin fortification, fiber, and bran in cereal are attracting adult consumers. And, to meet everyone's preference, cereal firms are constantly launching new products. Recent examples include: *Fiber One, Bran Muffin Crisp* and *S'Mores Crunch* from General Mills; *OJ's* and *Extra-Fiber All-Bran* from Kellogg's; and *Sun Flakes* aspartame-flavored corn flake cereal from Ralston Purina.

This steady flow of new products constantly changes the face of the market. In 1984, four companies supplied 75% of the total breakfast cereal market—slightly less than in 1983. Kellogg had about 33% of total sales; General Foods took 21%; Quaker Oats held an 11% market share; and General Mills produced 10% of all sales. But Kellogg's campaign for its bran cereals—linking the consumption of fiber to prevention of cancer—reportedly has increased Kellogg's market share by about 4%. At the same time, GF's share may have slipped 2%.

The wave of "character" cereals is still with us. Last year, Kellogg added *C-3PO* cereal, while General Mills introduced *E.T.* and *Pac Man*, GF licensed the *Smurfs* for its *Smurfberry Crunch*, Quaker unveiled its *Mr. T*, and Ralston Purina licensed *Donkey Kong, Gremlins* and *Rainbow Brite*. These "character" cereals are usually presweetened. But a switch of sorts was Ralston's introduction of low-sugar *Cabbage Patch Kids* brand cereal. A response to consumer requests, it's the industry's first low-sugar cereal using a licensed property.

Steady growth forecast

A slowly growing population, along with concerns for health and nutrition, suggest very modest gains for grocery products over the next five years. The value of shipments of cereals (in constant dollars) between 1985 and 1990 should rise 0.9% annually, a rate equal to the increase in population. But the number of children aged 5-14 will increase 1.2% yearly. This demographic phenomenon may indicate increased consumption of presweetened cereals. The population segment aged 20-49 will gain 1.3% annually, so cereal companies will probably continue to market cold cereals targeted to the adult market.

In 1985, shipments by the cereal industry should rise 1.4%, adjusted for inflation. Changes in ingredient prices, especially for fruits, will likely have a greater impact on costs.

In the future, breakfast cereal firms may devote more resources to important markets for hot cereals. Between 1985 and 1990, the population aged 65 years and over will rise 2.1% yearly. Likewise, the population of children five years of age and under will increase 0.8% annually. Both these population groups are large consumers of hot cereal for reasons of taste, texture, nutritional value and lower retail price.

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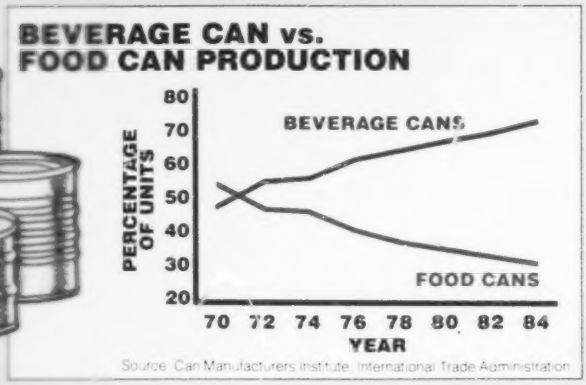


CANNED FOODS

Dianne L. Taylor, Associate Editor

Canned food consumption continues to decline, but certain segments of the market, including Mexican and specialty foods, are showing signs of growth.

Over the past five years, food can production declined at an average rate of 2 percent a year—mostly because of decreasing consumer demand. "Canned food consumption in general," says a Commerce Department spokesman, "will continue to decrease from .5 to 1 percent annually over the next five years."

Greater use of frozen and fresh foods, in combination with a trend toward eating away from home, will fuel the gradual erosion of the canned foods market, sources agree.

Fruits/vegetables

Although the current dollar value of production of canned fruits, vegetables and specialties rose 4.4 percent in 1984 to $20.9 billion, the value of production declined almost 2 percent after adjustment for inflation.

Per capita consumption of canned fruit, in particular, declined from 29 to 23 percent of total fruit consumption between 1978 and 1983; fresh fruit consumption took up the 6 percent slack and increased to 65 percent of the total market. Says market research firm Business Trend Analysts: "As the trend towards healthy eating continues through the 1980's, canned fruit consumption is expected to stagnate." Del Monte reports the market for canned fruits plummeted even further in 1984—about 4 percent.

Canned vegetable demand followed a similar pattern, with consumption declining about 1.5 percent annually over the last five years. Consumption will continue on the same decline for the next five years, says the Department of Commerce.

Room for optimism

Though even canned food giant Del Monte and can-maker Continental Can are not predicting a return to the high-growth market canned foods once knew, sources agree there is profit potential for certain canned food segments—namely, canned tomato products, specialty foods and low-sodium/light items. Demand for these foods has increased recently with the onset of pasta popularity, more disposable income and greater health awareness.

Squeezing a profit out of the tight canned foods market, says Continental Food Packaging's General Manager of Sales and Marketing James D. Beam, can be done. Like Del Monte, he says, processors must make the effort to meet changing consumer needs. "I'm not predicting massive growth in canned foods," he admits, "but there are segments ripe for growth if processors update the product *inside* the can to appeal to consumers."

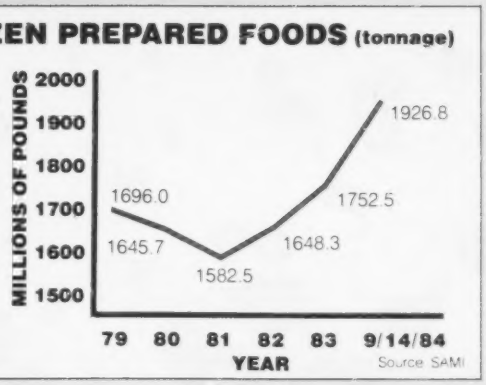
Del Monte, despite the decline of overall canned vegetable consumption, churned up profits in this category last year. The company's $10-million "No Salt Added" canned vegetable campaign succeeded in carving out a new market within the canned vegetable segment for Del Monte. No Salt Added vegetables now make up 10 percent of the company's U.S. vegetable sales, and the line increased Del Monte's share of the overall canned vegetable market to 23 percent. "Americans are more concerned with nutrition and eating right than they were just a few years ago," says Del Monte's President of the Dry Grocery and Beverage Products Division Fernando Gumucio. "We needed to change the image of our canned products to address these concerns if we were to stay in this business."

Del Monte's Lite Fruits—another variation away from traditional canned fruits packed in heavy syrup—also reeled in sales for the firm. Lite fruits accounted for 19 percent of the company's U.S. canned fruit sales in 1984.

Progresso is another company that has made the can work. Progresso's total soup volume climbed 48 percent in 1983 and is estimated to have grown by the same amount in 1984. The company, a subsidiary of Ogden Corp., has positioned its canned soups as high-quality items and is said to be "obsessed with fresh, quality ingredients."

"Unfortunately, the majority of food processors haven't changed their canned foods with the times," says Beam. "And that's the main reason why consumer demand has slackened off so much."

Another segment ripe for growth within the canned foods market: Mexican foods. The Hispanic population—the main consumers of Mexican canned foods—in the U.S. has increased by more than 61 percent over the past decade. And according to the Census Bureau, anywhere from 15- to 30-million immigrants (legal and illegal) will enter the U.S. between 1985 and 2000, with 50 to 70 percent of them being of Hispanic origin.



FROZEN FOODS

Dianne L. Taylor, Associate Editor

Frozen foods have been showing surprisingly strong growth for a market considered saturated just a few years ago. But the sales rise has not been across the board.

Increasing popularity of gourmet entrees has been responsible for nearly all the growth in the frozen foods market, and Mexican, Oriental and "microwaveable" foods are performing with vigor. On the other end of the spectrum are the frozen fruit, vegetable, and 'regular TV dinner' categories—three markets where growth has been particularly weak over the last few years.

Frozen entrees

In 1984, frozen entree sales were up by 9.2 percent over 1983. Premium and/or low-calorie single dishes and complete dinners spurred most of the success.

Premium and/or low-calorie single dishes account for about 37 percent of 1984 retail sales of all frozen single dishes, says Find/SVP. Upscale, complete dinners are expected to capture 52 percent of total frozen complete dinner sales for 1984.

Single dishes, the largest processed frozen food category, showed a retail dollar sales growth of 18.5 percent from 1978 to 1984 (a compound annual rate)—to over $2.5-billion.

Nationality foods—Mexican and Oriental dishes—have caught on, too, says Find/SVP. Retail volume of frozen Mexican foods for 1984 is estimated at 148-million pounds, valued at $265-million. Retail poundage of frozen Oriental food has increased at an average annual rate of 33 percent since 1981, while dollar volume has grown by 49 percent. Estimates for 1984 volume value the frozen Oriental category at $297-million; or 88.9 million pounds.

Hors d'oeuvres sales are forecast by Find/SVP to reach $390-million by 1990, or four times 1984 sales of $91-million. Pizza flavored snacks comprise three quarters of current sales.

All sources agree that "microwaveable" foods—like these hors d'oeuvers—will grow in the future. According to Campbell Soup Company, microwave ovens will be in 70 to 80 percent of all homes by the year 2000.

Low growth segments

The dollar value of frozen fruit and vegetable shipments declined about 10 percent in 1984 as compared to 1983—despite stable shipments. Because of unusually high increases in production and energy costs, frozen vegetable processors are introducing brand name combination vegetables with sauces—products that not only focus on consumer demands but command a higher profit margin than traditional vegetables. Many of these items can be used in the microwave and offer a strong brand appeal.

As vegetable processors continue efforts to meet changing consumer tastes throughout the coming decade, predicts Business Trend Analysts, profitability will become the rule rather than the exception.

Says the market research firm: In 1972, 40 percent of all processed vegetables were frozen; today 50 percent are frozen. Shipments, however, have remained stagnant since 1981.

Adds one analyst: "Manufacturers in this category could reverse a declining growth trend."

Frozen fruits account for 9.8 percent of the total fruit market—a figure that has remained stable over the past decade.

Other frozen food categories that have lost ground recently, according to Find/SVP:

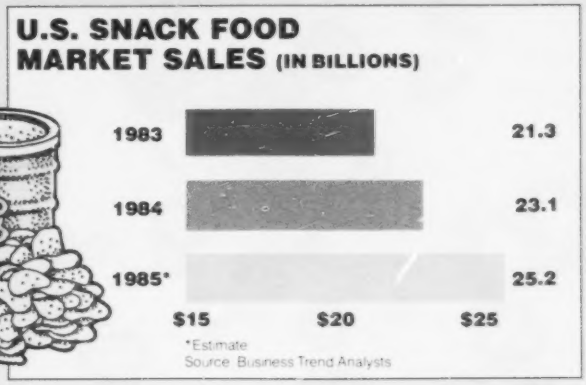
- The $457-million regular TV dinner market. Quickly losing ground to premium and low-calorie entrees, this mature market is expected to decline over the next five years. In 1984, it accounted for about 50 percent of total frozen dinner sales.
- The $806-million frozen pizza market. This category declined in poundage in 1982 and 1983, and 1984 sales were flat.
- Pot pies, estimated at 1984 retail sales of $245-million. Pot pies are expected to remain flat for the remainder of the decade, but, says Find/SVP: "There is a very real possibility that the category could be revitalized by the introduction of a premium quality product."

Imports/exports

After two years of declining frozen exports, U.S. exports of frozen foods increased 8.2 percent in 1984 to $300-million, according to the U.S. Department of Commerce.

Frozen vegetables accounted for 20 percent of these exports, and frozen potato products made up 17 percent.

Frozen food imports into the United States increased about 46 percent in 1984, but they only accounted for 2 percent of total frozen food consumption in the U.S. Frozen broccoli is our largest import item.



SNACK FOODS

Dianne L. Taylor, Associate Editor

Sales in the snack food market have tripled over the past decade, and in 1984, the growth trend continued. But the soaring cost of cooking oils, along with increased processing costs, is putting a strain on some processors' profits.

Sales in this category have remained strong thanks to innovative new product introductions and strong marketing and promotion programs. Potato chips, for instance, have grown to a nearly $2.9-billion market, thanks to new products like thick-cut, low-salt, light and/or newly-flavored items. Frito-Lay spent over $50-million researching and developing its successful *O'Grady's* thick-cut potato chip line, which was introduced nationally last year and has reeled in over $100-million in sales since test market introduction in 1983. The chips are also available in flavored varieties.

Some snack food firms have quickly capitalized on microwave oven ownership, adding to the success of this category, says MRCA Information Services. Unpopped, 'microwaveable' popcorn, for one, is "burgeoning," says MRCA.

Granola bars, too, contributed to this segment's success. Though demand is slowing down somewhat, scores of new product introductions pushed sales in the granola category up by 20 percent in 1984 over 1983. Quaker captured 40 percent of the $350-million granola snack market with the introduction of the first chocolate-dipped granola bars, called *Granola Dipps*. Analysts agree that the market is beginning to mature, since sales growth has slackened off since 1983.

'Wholesome' snacks have also contributed to snack foods' success. Fresh fruit consumption has grown, reflecting consumer preferences for fresh, 'good-for-you' foods. Says an MRCA Information Services study: Fresh fruit is consumed an average of 42.6 occasions per year per capita across the country, compared with 50.1 occasions per year per capita for salty snacks, including potato and corn chips, nuts and popcorn.

The trend toward 'wholesome' snacks is evident in the processed snack market, too, says General Mills. General Mills' Fruit Roll-Ups is one of the largest-selling brands in the 'wholesome' snack category, says General Mills, and the product posted "strong" volume gains in 1984. The dried fruit market finished 1984 with a 30 percent increase in sales—due mostly to a strong gain in the fruit roll category.

Yogurt has also emerged as a solid market performer, according to Business Trend Analysts (BTA). Per capita unit sales of yogurt have more than doubled in the last decade and now stand at 3.38 pounds. Close to 800-million pounds of yogurt were sold in 1984, and sales have grown at an average annual rate of more than 7.5 percent since 1980. BTA expects per capita unit sales to reach 4.14 pounds by 1994, as total annual domestic production tops the 1-billion pound mark.

According to BTA, the entire $23.1-billion snack food market (including yogurt, cookies, snack cakes and pies, salty snacks, cheese curls, fruit snacks and frozen snacks) will expand at an average annual rate of 9 percent over the next ten years.

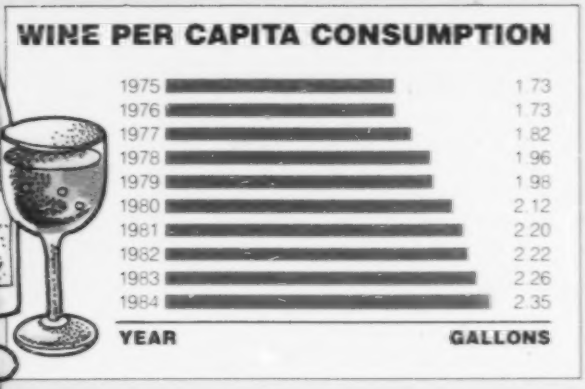
Why such growth? Today's young, upwardly mobile professional market is expanding. Yuppies, said tracker of new products Martin Friedman in a recent article, especially singles under 45 years old, are the biggest snackers and grazers; they snack 30 percent more often than the rest of the population.

Profit strain

Despite snack food growth, many processors are having problems keeping up their profit margins. Borden, manufacturer of *Wise* snacks, *Cottage Fries* potato chips and other snack items, says despite an 11 percent increase over 1983 in its snack segment, "income remained virtually unchanged" due to the "highest costs for cooking oil in ten years." Increased marketing expenditures played a part in Borden's setback, too.

USDA estimates show that the price of soybean oil increased 48 percent in 1984, and prices for all other cooking oils followed a similar pattern. The agency predicts further price increases for all oils in 1985 because demand for soybean cattle meal has decreased along with the decline in beef production. In turn, this has lessened the demand for crushed soybeans—resulting in a smaller cooking oil supply.

Frito-Lay, which dominates 40 percent of the country's salty snack food market, is attempting to absorb this and other cost increases without sacrificing profits. The company has developed an 'increased-solids' potato that yields more finished product per pound of raw material. The installation of more precise weighing and packaging machines at five production facilities, too, has enabled Frito-Lay to increase profits. "The saving from this measure alone is the equivalent of one manufacturing plant's annual capacity," says the firm.



WINE

Marla S. Stein, Editorial Assistant

Wine, accustomed to fast-track growth in the 1970s, has found the 1980s a different story. While sales continue to increase — 2.3 percent in 1983, 2.6 percent in 1984 — and per capita consumption is also on the rise, growth is substantially below expectations. In addition, much of the growth in wine can be linked to the phenomenal success of wine coolers.

Imports. In a word, this is the major problem facing American vintners. A strong dollar has made European wines more affordable to U.S. buyers while American wines are more expensive in foreign markets. It is now estimated that European wine has carved out a vigorous 25 percent market share in the United States.

American producers are responding to the import challenge with legislative and promotional tactics. The Wine Equity Act, endorsed by the Wine Institute, calls for equal tariff and non-tariff treatment of American and European wines. Equal wine taxes, it is believed, would allow American wines to better compete with European prices.

California vintners and growers approved a marketing order that established the Wine and Winegrape Improvement Advisory Board. Its goal? To promote California wines by raising consumer awareness and acceptance. Allocations of the board's approximate $4 million income include $1.6 million for market development and $1 million for trade development.

The decreasing gains in wine consumption are another factor spurring price reductions throughout the United States. Between 1982 and 1984 the cost per case of Gallo's Chablis Blanc, Almaden's Mt. White Chablis and Paul Masson's Chablis experienced cuts ranging from $1-$3. So far, the price war has been contained to lower-end brands while most producers are relying on their higher-priced, better quality wines to maintain profit margins.

Domestic market trends

Table wines continue to lead with roughly 80% of total domestic wine shipments. The past ten years have seen white wine shipments grow from under 50% to over 63%. The current health and fitness swing has influenced this growth with the consumer perception that white wine is lower in calories and alcohol content. The red wine share has dropped to 21.9% and the rosé to 14.9%.

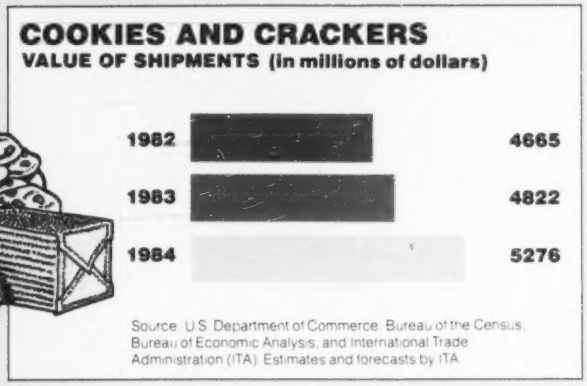
The wine cooler — wine, fruit juice, carbonation, and sweeteners — has rapidly captured an impressive 5% of total wine sales. Since its market entrance in 1982, cooler sales have jumped from 200,000 gallons to roughly 27 million gallons in 1984. *California Cooler* was the first of these popular wine beverages. One notable feature of this product was how it broke ground with its distribution through beer wholesalers. This strategic move placed coolers in the beer and soda drinker market. With a 4-7 percent alcohol content, the cooler is attractive to wine drinkers opting for less sophisticated wines and lower alcohol contents.

Entries into the wine cooler market are increasing at a tremendous pace. As producers with large marketing and advertising budgets launch their coolers, competition will intensify. 1985 will lead to an inevitable shakeout. Currently boasting more than half of the cooler market, California Cooler is likely to remain prominent next year — with Gallo, Seagram, Heublein, Canandaigua, and the Wine Group emerging as contenders. With a predicted average growth rate of 13.5% annually, shipments for 1993 are estimated at 83.5 million gallons, according to Business Trend Analysts.

Effervescent success

Sparkling wines are also causing a stir in the industry with an average annual increase of 9.5%. Effervescent wines have become more accessible to the consumer as prices have dropped into a range comparable with other wines. The time has passed when consumption of these wines was restricted to special occasions. Champagne provides the wine drinker with an interesting alternative to table wine. Gallo is the leading producer of sparkling wine with its popular *Andre* brand. Other producers who have realized success in this market include Almaden Vineyards, Franzia Brothers, ISC Wines of California, F. Korbel, Weibel Champagne Vineyards, Canandaigua, Monarch and Taylor.

Some forecasters believe higher consumption of wines, including more expansive vintages, will be linked closely to the 25 to 44 age group. By 1992 this market is projected to consist of almost 83 million people. Combined, these figures would seem to precipitate promising market growth. But, it is also predicted that European imports will grow at unprecedented speed, possibly swelling to over 33% of total U.S. wine sales by 1993. Effervescent wines and wine coolers will continue to exhibit the most growth in the domestic market.


COOKIES AND CRACKERS
VALUE OF SHIPMENTS (in millions of dollars)
1982
4665
1983
4822
1984
5276
Source: U.S. Department of Commerce, Bureau of the Census; Bureau of Economic Analysis, and International Trade Administration (ITA). Estimates and forecasts by ITA.

BAKERY

William C. Drennan, Senior Editor

In 1984, industry performance varied among the different segments of the bakery products group. Shipments of white pan bread continued to decline, while shipments of variety breads continued to grow. Shipments of white bread-type rolls increased, and sales of sweet goods recovered appreciably from a decline during the 1981-82 recession. Cookie shipments expanded significantly, and sales of crackers rose even faster.

Cookies rise sharply

Significant changes occurred in the cookie market in 1984. From 1978-83, the industry registered a 1.3% yearly growth in the value of shipments, adjusted for inflation. In 1984, constant dollar shipments jumped 5.7%. During the 5-year span, shipments of cookie products rose 1.7% annually. In 1984, they increased to an estimated $2.9 billion (current dollar), a constant dollar advance of 2.6%.

Between 1978 and 1983, poundage of cookie production dropped 2.2% a year. In 1984, however, output of cookies gained an estimated 5.7% to 1.8 billion pounds. These production trends reflect per capita consumption. From 1978 to 1983, per capita consumption of cookies declined 3.6% annually. In 1984, however, estimated consumption of cookies soared 4.8%, to 7.7 pounds per capita.

Introduction of new products, vigorous competition among cookie makers, and changing consumer preferences contributed to the gain for cookies in 1984. Until 1982, most packaged cookies had a crumbly texture. Softer cookies were only available in specialized outlets and retail bakeries. In 1982, Frito Lay, the snack food division of PepsiCo, began to market a soft cookie. Frito Lay uses an extensive route system to deliver its products to supermarkets, and its initial success attracted other food companies. In 1983, Proctor and Gamble introduced a soft cookie with a solid circumference and chewy center. These characteristics, made possible by the use of corn syrup as a sweetener, appealed to adults as well as children.

As these soft cookies succeeded, established firms responded to these new rivals. Nabisco, the industry leader, launched a new line of soft cookies and reformulated existing products. The company also intensified advertising and promotion efforts. Keebler also brought out soft cookies. Of the four major cookie-producing companies, only American Brands has yet to enter the soft cookie market.

The price of wheat flour, which represents almost 51% of the total value of agricultural commodities used by the bakery products group, remained essentially unchanged in 1984. Prices of flour-based mixes and doughs, which are about 4.3% of total ingredient costs, increased slightly but stayed well below the weighted average increase of 4.1% for all ingredients.

The price of nonfat dry milk actually declined, while the price of refined sugar, which constitutes about 11.0% of total ingredient cost, edged up 2.0%.

Producer prices of other ingredients rose sharply. Prices of corn syrup jumped 11.6%; lard, more than 30.0%; 100-percent vegetable shortening, 44.2%; and processed eggs, which provide 2.0% of edible inputs, had a price increase of 40.2%.

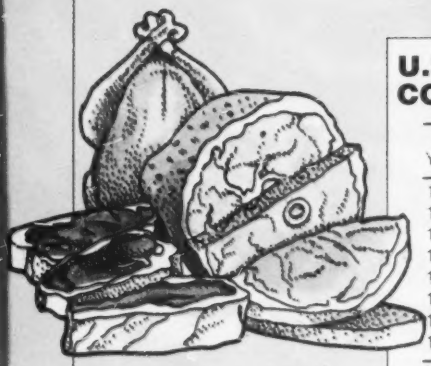
Prices of packaging material climbed more than most major commodity prices. Paperboard prices gained 7.4%, while prices of cellophane were up 5.2%. Other plastic packaging prices increased only 2.1%. Prices of laminated paper climbed 3.2%.

The value of imported bakery goods has consistently exceeded the value of exports. In 1984, total imports reached $198.5 million, with cookies and crackers providing 85.5% of the total. To avoid problems of exporting into the United States, and to penetrate the U.S. mass market, foreign firms have located in the U.S. United Biscuit Ltd. of the U.K. owns Keebler Biscuit. Biscuit General of France owns Burry Biscuit Co. George Weston Ltd. of Canada owns Interbake. In 1984, foreign-owned enterprises generated about 1.8% of U.S. sales of bread and similar items and 20.7% of cookie and cracker sales.

Changes in industry structure

During 1984, two significant acquisitions occurred in the bakery products industries. Ralston Purina Company agreed to purchase Continental Baking from ITT for $475 million. Previously, Ralston Purina held a 1.5% share of the cookie and cracker market. Continental Grain sold its western division of Oroweat Food Inc., for $60 million to General Foods, owner of Entenmann's Inc. With a 0.9% market share, Entenmann's ranked 16th in the bread and similar products industry.

In 1985, bakery industry shipments should gain 2.7% in constant dollars. Among the various segments of the industry, growth is estimated to range from 2.1% for the bread and related products industry to more than double that, 4.5%, for the cookie and cracker industry. Steady labor costs and moderate price increases for ingredients will help both industries.



U.S. PER CAPITA MEAT CONSUMPTION (IN POUNDS)

	Red meat[1]				All meat	
Year	Beef	Pork	Other[2]	Total	Poultry[3]	Products
1977	91.7	55.8	4.7	152.2	53.2	205.4
1978	87.2	55.9	3.8	146.9	55.9	202.8
1979	78.1	63.8	3.0	144.9	60.5	205.4
1980	76.5	68.3	2.8	147.6	60.6	208.2
1981	77.1	65.0	3.0	145.1	62.4	207.5
1982	77.2	59.0	3.1	139.3	63.8	203.1
1983	78.7	62.2	3.1	144.0	65.0	209.0
1984	77.4	60.6	3.2	141.2	65.6	206.8

[1]Retail cut equivalent
[2]Lamb, veal, and mutton
[3]Ready-to-cut
Source: U.S. Department of Agriculture

MEAT

William C. Drennan, Senior Editor

Consumption of red meat products was down in 1984, after a slight rise in 1983. Red meat consumption has declined almost steadily since 1977, because of changes in meat prices, erratic supplies and consumer concern about health. About three-fourths of all meat consumed in 1977 was red meat, but by 1984 the share had dropped to 68%. Beef production was 23.6 billion pounds in 1984, with a decrease of 3% projected for 1985. Pork production declined to 14.8 billion pounds, with a further decrease of 1½% projected for 1985.

Poultry production, on the other hand, was up in 1984 to 16.0 billion pounds. Demand for poultry products has been very strong in recent years. New products, such as boneless chicken breasts, chicken hot dogs, finger-sized poultry products and chicken entrees have gained wide acceptance. As a result, per capita consumption of poultry has risen from 53 pounds in 1977 to an expected 68 pounds in 1985. Some projections have per capita poultry consumption surpassing beef by 1990.

Herd sizes for cattle have been declining for three straight years, reflecting, according to Jens Knutson, economist for the American Meat Institute, bad economic conditions on the farm. Knutson feels that the farm debt load is such that even if meat prices rise due to demand, bankers may still refrain from lending. Knutson believes that this will prevent herd expansion until farmers become more financially stable. Needing to generate more dollars, farmers will emphasize herd marketing, rather than herd expansion.

Poultry farms at capacity

Poultry farms, however, are operating at or near capacity. The demand is so great, according to Bill Roenigk, economist with the National Broiler Council, that there is not enough housing or hatchery capacity to meet it. Roenigk projects a 5% increase in production in 1985, and another 4-5% increase in '86. Roenigk finds that cycles in the poultry industry are becoming longer, with less pronounced peaks and valleys. He believes this is due to the steady demand large food manufacturing companies are placing on poultry products, tempering ups and downs in the marketplace.

Employment in the red meat industry remained unchanged in 1984 at 197,200 workers. A few major companies closed packing facilities, but other plants that had been closed were reopened under different management. The renegotiating of labor contracts reduced average hourly earnings to $8.19 in 1984 from $8.61 in 1983. Employment in the poultry industry totaled 125,600 workers, an increase of 4.2% over 1983. To increase productivity, larger and more automated facilities are being built. Capital expenditures for new plants and equipment rose from $58 million in 1972 to $237 million in 1984.

In 1983, the top four meat packing firms accounted for over 25% of total sales within the industry. These firms were IBP, Armour & Co., EXCEL, and Oscar Mayer. On the other hand, the top four firms in the meat processing industry accounted for less than 15% of meat processing sales. These firms included United Brands, Consolidated Foods, Beatrice Companies, and General Foods. The top four poultry firms account for almost 20% of total industry sales. These include Gold Kist, Continental Grain's poultry division, Holly Farms of the Federal Co., and Cargill's poultry division.

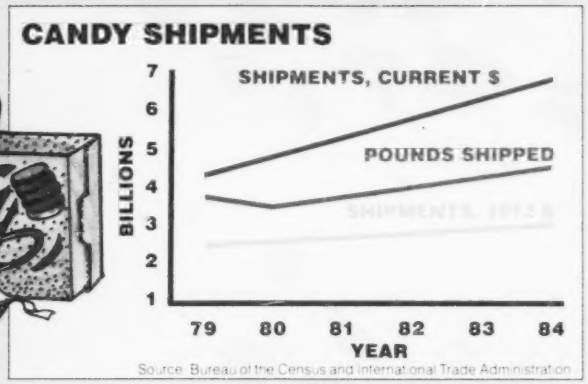
U.S. is a net importer of red meat

Although the United States is the world's major producer of red meat, it remained a net importer in 1984, importing over one million metric tons and exporting 250,000 metric tons. A significant portion of U.S. exports are cattlehides.

However, for the first time in recent history, the value of red meat exports (including cattlehides) in 1984 was greater than the value of imports. The value of U.S. exports increased 14% to $2.0 billion. Exports of hides totaled more than $1 billion, while exports of beef increased 10%, to about $670 million. Meanwhile, value of meat imports declined 13% to $1.9 billion. Imports from Australia and New Zealand, which account for almost half of U.S. imports were off 30%.

U.S. imports of poultry and related products rose to an estimated $25 million in 1984, a 62% increase over 1983. Imports still account for less than 0.2% of domestic consumption. U.S. exports of poultry products account for less than 2% of 1984 production.

The U.S. Industrial Outlook expects industry shipments of red meat, measured in constant 1972 dollars, are expected to decline almost 2% in 1985. For the second year in a row, livestock prices are expected to increase between 3% and 7% in 1985. Meanwhile, the poultry industry will continue to see real growth in 1985. The value of shipments by the poultry and related products industry, measured in constant 1972 dollars, is expected to increase 3.9% in 1985.



CANDY

William C. Drennan, Senior Editor

Candy demand increased in 1984. With improved economic conditions in 1984, U.S. consumers purchased about 4.3 billion pounds of candy, an increase of about 4% from 1983 levels. Demand for U.S. candy rose about 3.1%, while consumption of imported candy, which represents about 5% of total candy, rose about 15%. Between 1980 and 1984, total candy consumption increased at an annual rate of almost 5%.

The value of all candy shipments was almost $6.4 billion in 1984. Adjusted for inflation, the value of chocolate and nonchocolate candy shipments increased by 2.4%. In 1984, per capita consumption of chocolate and nonchocolate candy reached an estimated 18.2 lbs. — an increase of 3%. Per capita consumption of chocolate candy alone increased about 4.5%.

Targeting a new audience

The industry has improved since 1980, when per capita consumption was down to 16 lbs. Candy was perceived as having no nutritional value and contributory to poor health. Led by M&M/Mars, the candy industry responded by campaigning to position candy as "snack" food, rather than "junk" food. M&M/Mars moved advertising from kiddie oriented TV shows to adult oriented shows, specifically sports programs. The audience they are trying to reach is the 18-34 year old category. Emphasis is also being placed on the wholesome ingredients in candy — milk and nuts, for example.

M&M/Mars is dominating the marketplace, producing six of the country's top ten candy products, with *Snickers* leading by a wide margin. M&M/Mars controls approximately 43.3% of the industry, compared to Hershey's 25.6%. Peter Paul Cadbury was third with 8.3% and the remainder (22.8%) was divided among the hundreds of other manufacturers. According to DEBS Report figures for items sold through tobacco and candy distributors, *Snickers* alone accounts for 6% of all candy sales. Other M&M/Mars products in the top ten are *M&M peanuts* (No. 2), *M&M plain* (No. 4), *Three Musketeers* (No. 5), *Milky Way* (No. 6) and *Twix* (No. 9). Hershey holds the No. 3 spot with *Reese's Peanut Butter Cups*, No. 7 with *Kit Kat*, No. 8 with almond bars, and No. 10 with the milk chocolate bar.

M&M/Mars is maintaining its control of the industry, according to the LNA Report, by spending an estimated $55.5 million last year on advertising, compared to an estimated $36.5 million for Hershey.

In 1984, a Finnish food processor, Huhtamaki, emerged as a major factor in the U.S. candy industry. Huhtamaki, which purchased most of the confectionery operations of the Beatrice Company and a confectionery subsidiary of General Mills, became one of the five largest U.S. confectionery producers. Also during 1984, the Nestle Co. acquired the candy brands of Ward-Johnson, Inc., in an effort to broaden its product line.

In 1984, candy manufacturers taking advantage of the perceived healthful nature of granola bars, by enrobing them in chocolate. The products are being distributed through traditional candy channels, and are also available in the breakfast foods, candy and snack foods sections of grocery stores.

According to the U.S. Industrial Outlook, U.S. manufacturers, responding to recent increases in the adult population and changing taste preferences, have been emphasizing chocolate candy production. In 1983, according to the Census Bureau, the volume of chocolate candy shipped was about 2.2 billion pounds and represented almost 57% of all U.S. candy shipments. In comparison, chocolate candy represented 51% of 1978 candy shipments. In value, chocolate candy shipments reached about $4 billion, totaling 70% of U.S. candy makers' shipments in 1983. This was a slight increase from the 67% share recorded in 1978.

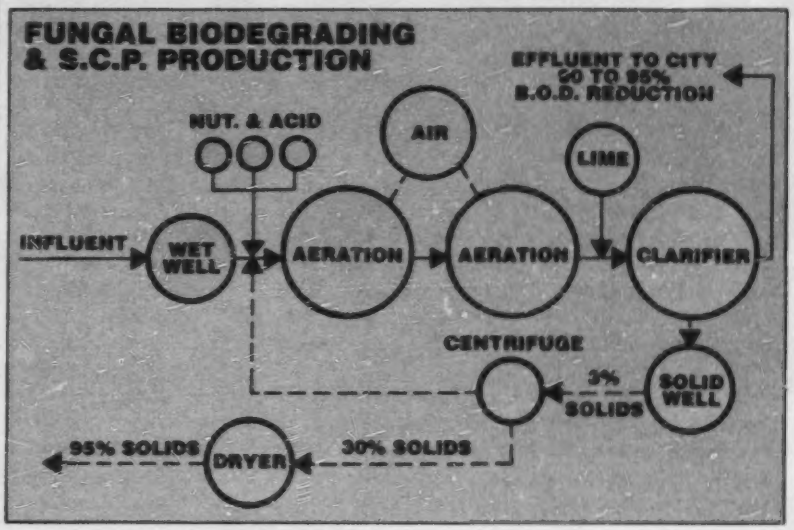
Deteriorating balance of trade

In 1984, the U.S. candy trade balance continued to deteriorate. The value of imports was $236 million, surpassing 1983 by 28%. The quantity of candy imported rose 34% to 228 million pounds. The average price per pound for imported candies declined by 4% to $1.03 per pound. The quantity and value of nonchocolate candy imports rose 14% and 26%, respectively in 1984, while the average price per pound declined 9%. The value of chocolate imports reached $127 million for the year, up 44%, while the quantity imported increased about 49% to 88 million pounds. The value of U.S. candy exports rose more than 15% from depressed 1983 levels, reaching about $74 million.

The growing importance of expensive chocolates is reflected in increasing U.S. imports from six Western European nations — Belgium, West Germany, Switzerland, France, Italy and the Netherlands — which specialize in producing this type of candy. In 1984, the value of U.S. chocolate candy imports from these six countries increased almost 74%, following an 87% rise in '83.

← Circle 54 or see FEM, p. 159

Lactose permeate-to-protein project may give dairies a "free" feed source



Using a fast growing fungi, this pilot process converts the influent (lactose permeate) into single cell protein (SCP) which can be used in high-quality animal feed. The fungi metabolizes the lactose permeate in about 12 hours, producing solids with about 40% protein content.

Economics
(100,000 gal/day)

Single Cell Protein Facility	
Initial Cost	$300,000
Income:	$1,650,000
Yield-12.5 Tons SCP/day (dry Weight) or 4,125 tons/yr @ $400	
Annual Cost	
Amortization	$42,706
$300,000 at 13%, 20 yrs	
Operation and Maintenance	
Power	$31,363
Manpower	$18,250
Maintenance	$6,000
Chemicals	$5,000
Taxes, Misc.	$5,000
Total	$108,319
Economics	
Income	$1,650,000
Less Annual Cost	108,319
Pre-Tax Net Income	$1,541,681

A dairy can create $1.5 million in pre-tax income by converting lactose permeate into single-cell protein based feed, according to calculations by the California Milk Advisory Board and Dairy Research, Inc., a subsidiary of the United Dairy Industry Association.

In May, 1985 (Page 178), *Food Engineering* reported the promising results to date of the dairy-farm ultrafiltration test sponsored jointly by the California Milk Advisory Board and Dairy Research, Inc., a subsidiary of the United Dairy Industry Association.

According to preliminary data released by CMAB halfway into the 12-month study, milk concentrated by 50 percent via ultrafiltration at the farm before shipping to cheesemakers cuts costs by 8 cents per cwt for the dairy farmer and by 69 cents per cwt for the cheesemaker for a total savings of 77 cents per cwt. The study is still in progress.

Now, UDIA is taking the process a step further with a pilot project to convert the lactose permeate—currently fed back to the cows—to a higher-quality feed product through farm-level fungal biodegradation of the permeate to single cell protein.

Plans for the pilot study were reported by Dr. Anthony J. Luksas, senior vice president for commercial research and development for UDIA, at Cheesemaking Symposium '85 sponsored by Chris Hansen's Laboratory May 1-2 in Milwaukee. More than 300 people from all segments of the dairy industry attended.

"Application of single-cell protein (SCP) technology to the permeate provides the opportunity to the dairy farmer to produce a high-quality feed that he now has to purchase from the outside," said Luksas.

Fast-growing, easily-cultured fungi can convert lactose permeate emanating from the UF process to SCP, Luksas continued. The fungus selected for the pilot system is *Aspergillus oryzae*, accepted by FDA for food applications and used to produce several food enzymes as well as to pretreat grain for soy-sauce production. Laboratory trials have shown that *A. oryzae* can in 12 hours metabolize a permeate stream of 3 percent solids to produce a mycelial biomass (equivalent to about half the original solids) of 40 percent protein with good amino-acid profile, low nucleic acid content and low fat content while reducing BOD_5 of the permeate by more than 95 percent, Luksas reported. (The disadvantage of feed with a high nucleic acid content, Luksas pointed out, is in the uridine content of the RNA, which can be metabolized to uric acid with consequent hazard of gout in the animal).

UDIA plans pilot scale-up as shown in the adjoining illustration at Utah State University, Logan, Utah, Luksas reported. The pilot plant will produce 300 lbs. of SCP per day to be fed to cattle in three forms: Liquid slurry (4 percent solids); dewatered cake (35 percent solids) and dried (90 percent solids). Trials are designed to determine feed efficiency plus impact of the feed on milk production, composition and flavor.

According to the figures shown in the table above, preliminary economics appear favorable: For a plant capable of handling 100,000 gal. of permeate per day, a capital investment of $300,000 plus annual operating costs estimated at $108,500 will yield pre-tax income of more than $1.5 million.

A smaller system designed to process 10,000 gal. of permeate per day would be about one-tenth as costly and one-tenth as profitable, Luksas added.

Preliminary studies show that the smallest cost-effective system—or the smallest system offering payback of capital investment in less than three years—would have a capacity of 1,000 gal. permeate per day.

Circle 70 or see FEM, p. 416→